Quarterly Report – Public Page

Date of Report: *9th Quarterly Report-December 21, 2020*
Contract Number: *693JK31810011*
Prepared for: *Government Agency: USDOT - PHMSA*
Project Title: *River Scour Monitoring System for Pipeline Threat Prevention*
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For quarterly period ending: *December 31, 2020*

1: Items Completed During this Quarterly Period:

During the 9th Quarter, the following items were completed:

Item #	***Task #***	***Activity/Deliverable***	***Title***	***Federal Cost***	***Cost Share***
31	***7***	Daily data collection	Collection of field data	$ 3,000.00	$ 7,500.00
32	***7***	Monthly analysis of data	Summary report of monthly data	$ 9,000.00	$ 9,000.00
45	***11***	Peer Review #2 – virtual	Preparation of peer review #2	$ 1,000.00	$ 0.00
42	***8***	9th Quarterly Status Report	Quarterly report	$ 2,175.00	$ 1,000.00

2: Items Not-Completed During this Quarterly Period:

The following tasks were not completed during this Quarterly Period:

Item #	***Task #***	***Activity/Deliverable***	***Title***	***Federal Cost***	***Cost Share***
34	***7***	Daily data collection	Collection of field data	$ 3,000.00	$ 7,500.00
35	***7***	Monthly analysis of data	Summary report of monthly data	$ 3,000.00	$ 3,000.00
36	***7***	Prepare report for each installation	Summary report for each site installation	$ 7,500.00	$ 7,500.00
38	***2***	Final System Design (version 5.0)	Development of final system	$ 9,000.00	$12,000.00
39	***5***	Final Software/Website Upgrade (version 4.0)	Development of final software and deployment	$ 7,500.00	$10,000.00
40	***7***	Prepare installation reports	Summary reports for each site	$ 5,000.00	$ 3,000.00
41	***8***	Preparation of draft final report	Draft report submitted for approval by DOT/PHMSA	$ 9,000.00	$ 9,000.00

Item 34, Task 7 – Daily data collection, we are currently collecting data from five recent installations of the River Scour Monitoring Systems that were deployed in late November, December, and March.

Item 35, Task 7 – Monthly analysis of data, we will continue to analyze the collected data from the installations.

Item 36, Task 7 – Summary report for each site installation, we are preparing these reports; however, we need to collect additional information due to the delay in obtaining permits for the installations.

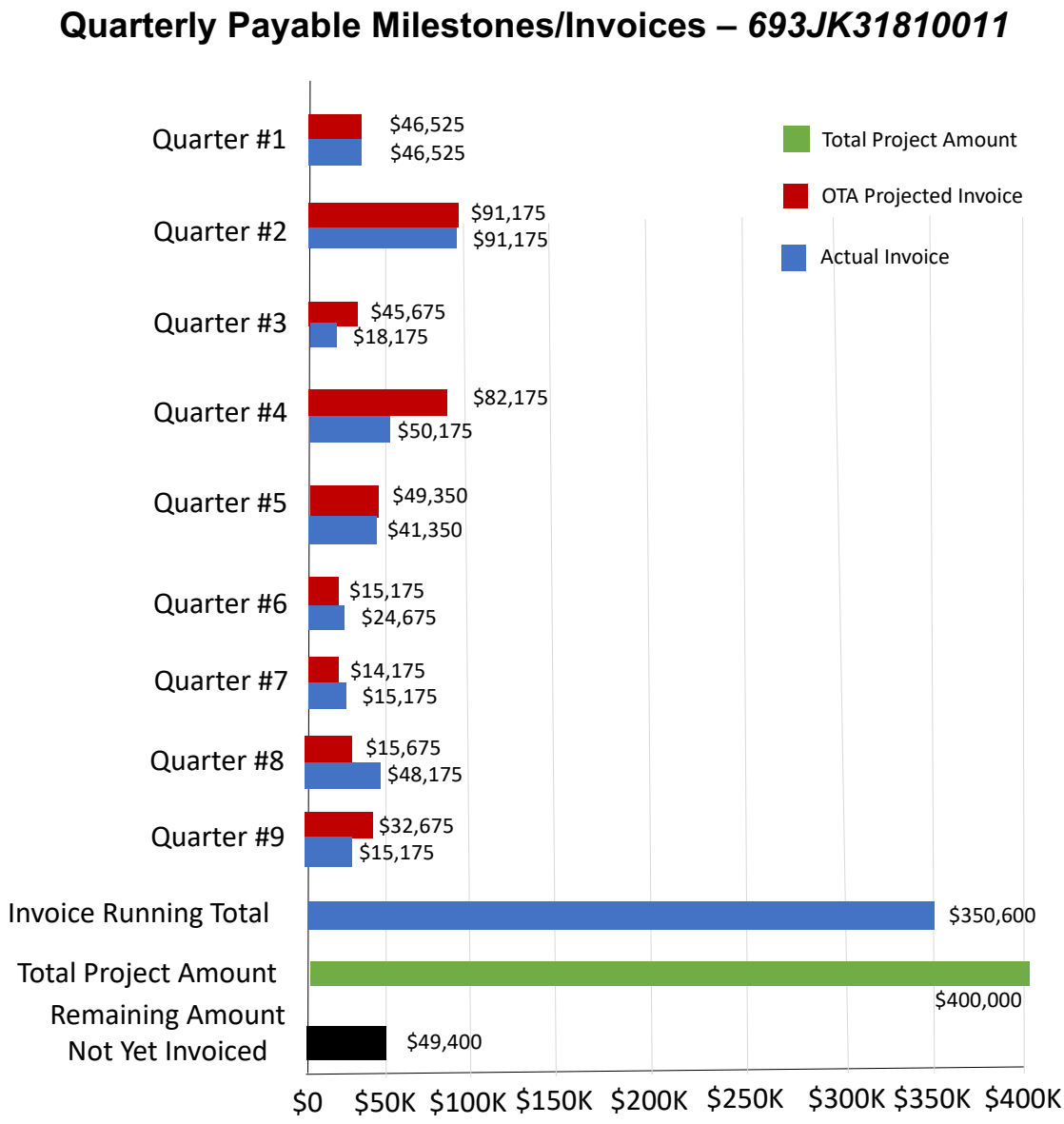
Item 38, Task 2 – The team is still working on the final software/website upgrade (version 4.0). They are all working remotely at this time making it a bit more challenging. We should have this completed early next quarter.

Item 39, Task 5 – The team is still working on the final software/website upgrade (version 4.0). They are all working remotely at this time making it a bit more challenging. We should have this completed early next quarter.

Item 40, Task 7 – Installations report are being compiled; however, not all data collection has been completed yet due to delays in installing the RSS as a result of permitting issues.

Item 41, Task 8 – The draft project final report will be completed once all data has been collected and analyzed.

3: Project Financial Tracking During this Quarterly Period:



4: Project Technical Status

Data Collection and Monthly Data Analysis

Item #31/32, Task #7 – Daily data collection (every 10 minutes) and monthly analysis was conducted for the five installations at the Tongue River (2), Elk River (2), and Freeman River (1) sites installed in November, December and March, respectively. Temperature data on the pipe, soil and air as well as a battery voltage is being collected every ten minutes at each sensor location since installation. Currently the data is viewed on the Pure hub with an interactive graph and downloaded as an excel spreadsheet.

Tongue River, North Dakota

The Tongue River system in North Dakota was installed between November 18th and 20th, 2019. Two pipelines are currently being monitored for temperature changes. Sample data on Pipeline #1 is presented in Figure 2 and Table 1, while data for Pipeline #2 is shown in Figure 3 and Table 2.

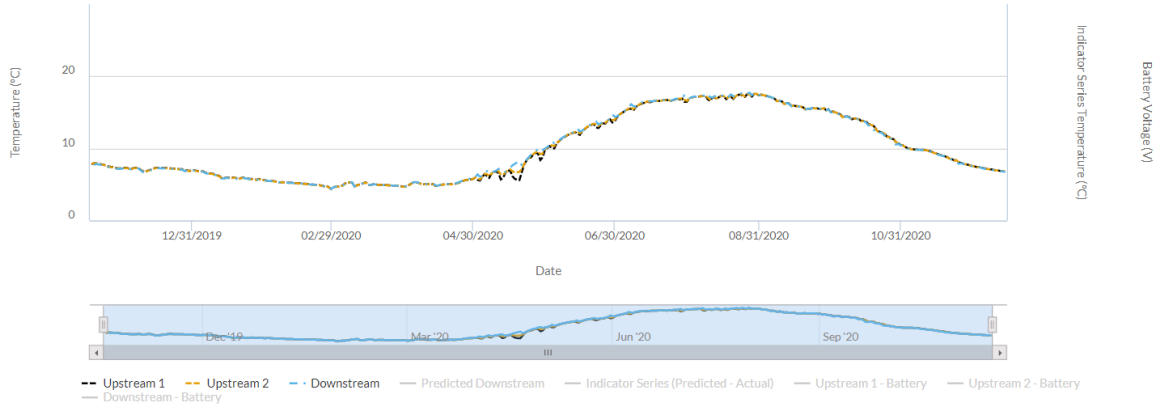


Figure 2. Pipeline Temperatures on Tongue River Pipeline #1

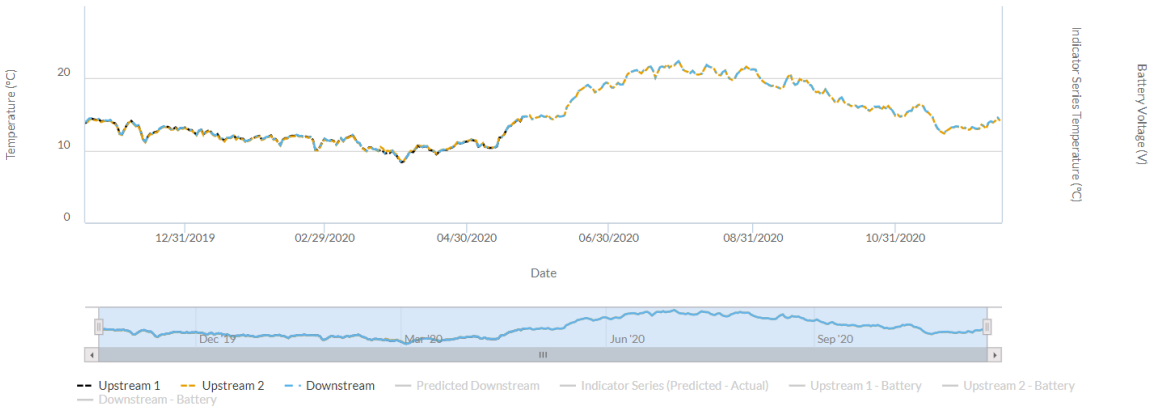


Figure 3. Pipeline Temperatures on Tongue River Pipeline #2

Elk River, Kansas

The Elk River system in Kansas was installed between December 3rd and 7th, 2019 in Kansas. Two pipelines are currently being monitored for temperature changes. Pipeline #1 was installed in the 1950s using open cut construction to cross the river. Pipeline #2 was installed in the 2000's and used a horizontal directional drill to construct the river crossing. Sample graphs and data tables for Pipeline #1 and #2 are presented in Figure 4, Figure 5, Table 3 and Table 4, respectively.

As part of the monitoring program, a crew was sent to the Elk River to collect bathymetric and depth of cover data to assess the amount of cover on the pipelines. Bathymetry was collected using a high resolution multi-beam sonar to create a map of the river channel bottom shown in Figure 6. There was no indication that the pipeline was exposed under the water. Depth of cover data was also collected by impressing an AC current on the pipeline and calculating the depth of pipe by measuring the strength of the induced electromagnetic field. Figure 7 shows the profile and plan of pipeline #1 at the Elk River crossing. The pipeline was not exposed, but found to have shallow depth of cover in the water channel.

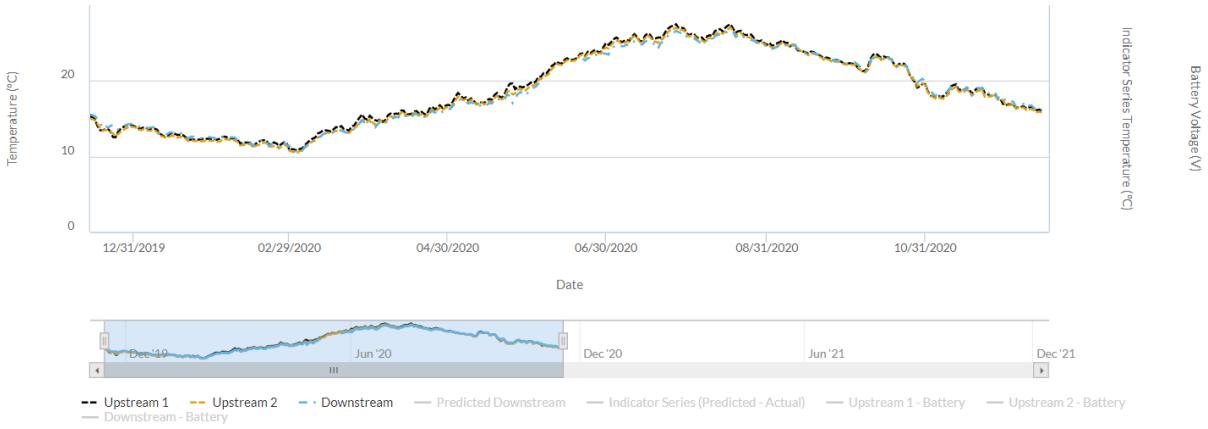


Figure 4. Pipeline Temperatures on Elk River Pipeline #1

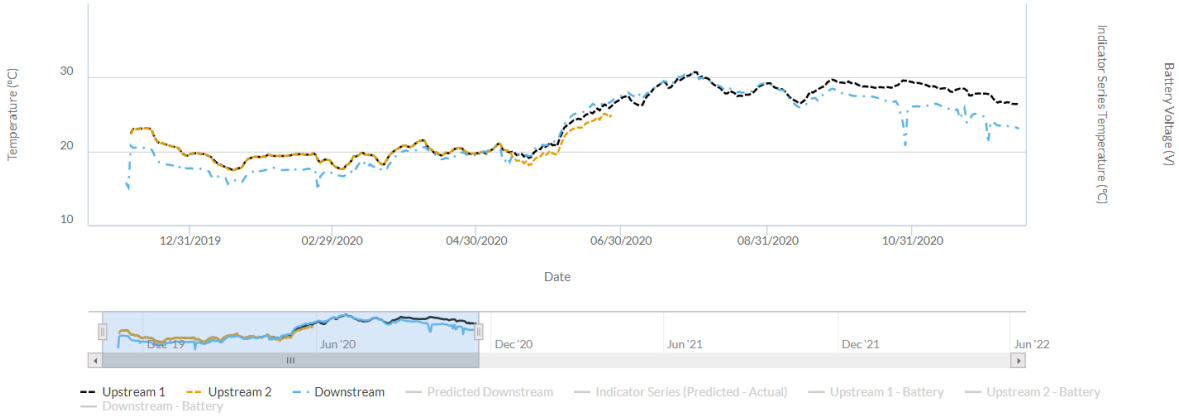


Figure 5. Pipeline Temperatures on Elk River Pipeline #2

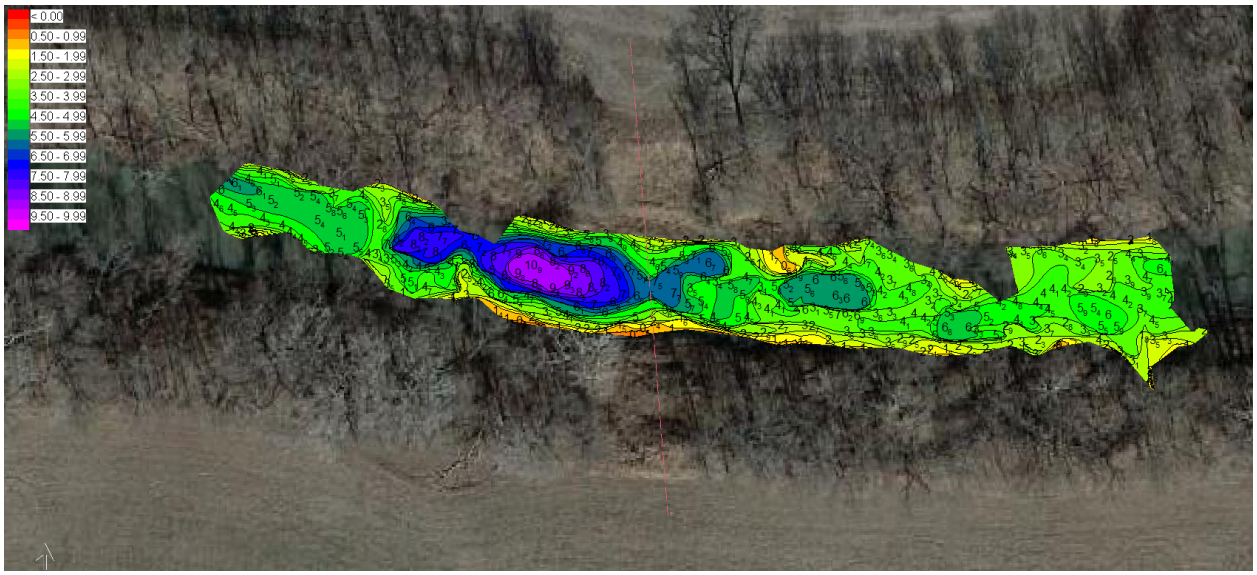


Figure 6. Elk River Crossing Bathymetry

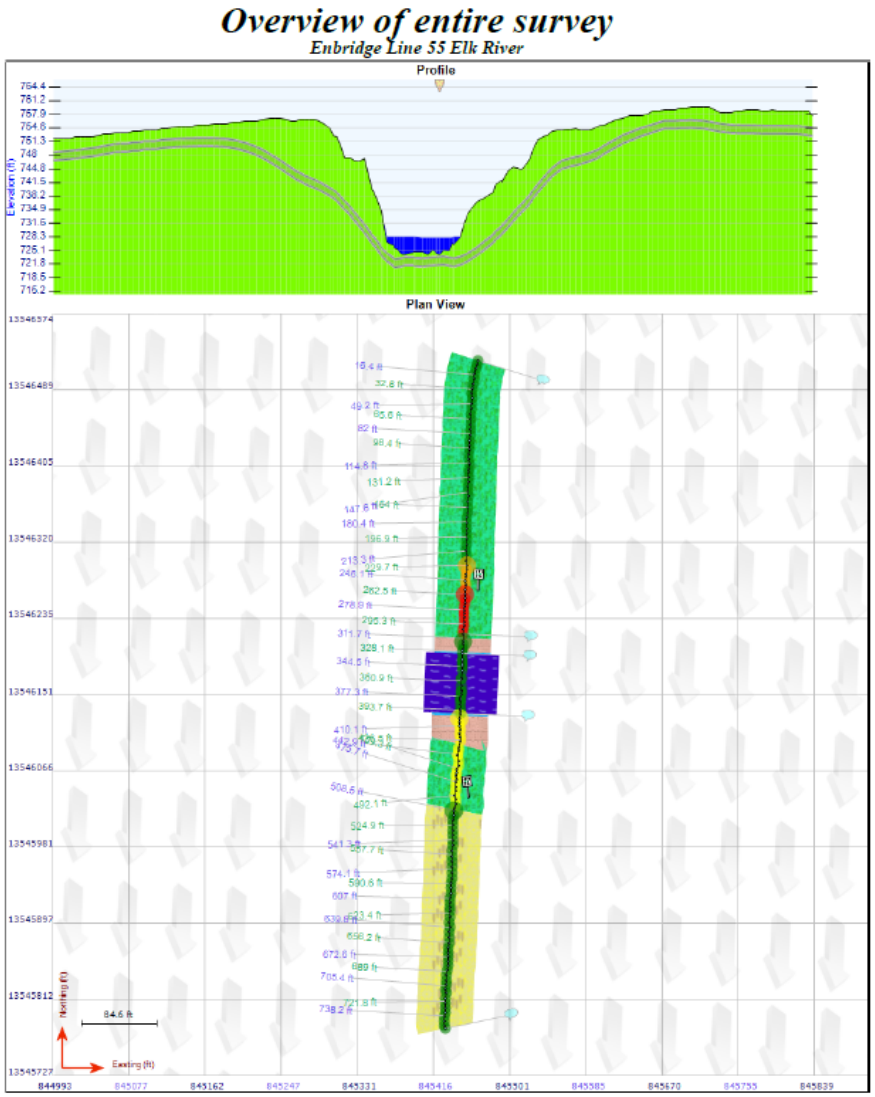


Figure 7. Elk River Crossing Plan and Profile

Freeman River, Alberta Canada

The Freeman River system was installed March 7-11, 2020 on a 16-inch pipeline owned and operated by Pembina Pipelines under the Freeman River near Fort Assiniboine, Alberta Canada. Three sensors were placed on the pipeline; two upstream and one downstream. The pipeline was exposed and recoated using conventional trenchless pipeline repair methods. The pipeline is currently being monitored for temperature changes. Sample graphs and data tables for the pipeline are presented in Figure 8 and Table 5. A camera system was installed in April 2020 to take daily pictures to monitor the river condition throughout the winter melt and subsequent flooding. In June 2020, after some high river levels, a potential scour was identified during analysis of the data. A crew was mobilized on a survey boat with a high-resolution multi-beam sonar device to map the bottom of the river to verify a pipe exposure as shown in Figure 8. After analysis, it was determined that the pipe area exposed to water was only 0.79 m^2. This will continue to be monitored over time.

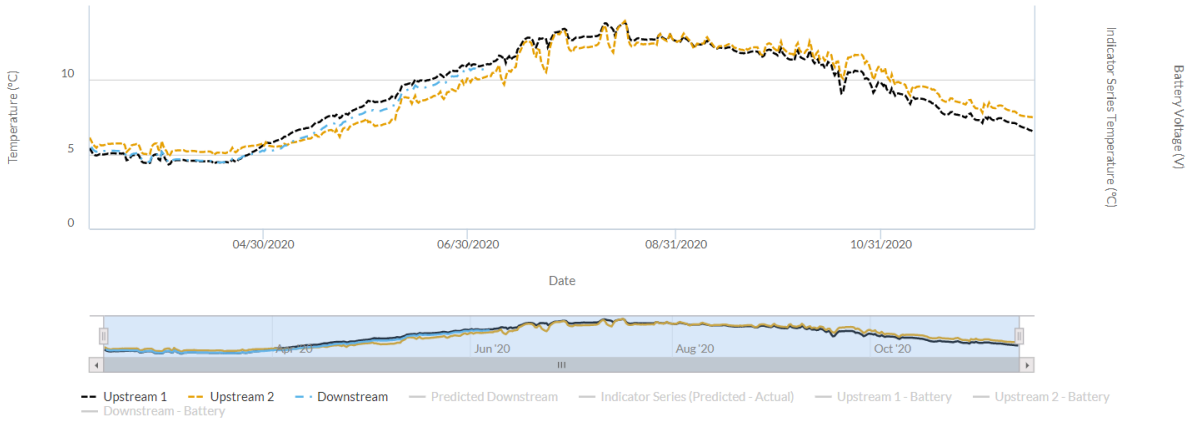


Figure 8. Pipeline Temperatures on Freeman River Pipeline

Peer Review #2 – Virtually Administered

Item #45, Task #11 - For Peer Review #2, a PowerPoint was prepared and a 30 minute virtual presentation delivered to a PHMSA panel on October 14, 2020. We fielded questions from the panel regarding technical aspects of the project.

5: Project Schedule

As previously discussed, the project is slightly behind schedule due to permitting issues, which delayed access and instrumentation of the River Scour Monitoring Systems (RSS) in North Dakota, Kansas, and Alberta. We are continually collecting and analyzing the data using remote communication.

The project team is currently working on the Final System Design (version 5.0) and the Final Software/Website Upgrade (version 4.0). We are slightly behind schedule due to the software team currently working remotely due to COVID-19. This has resulted in some logistical challenges; however, we feel that these two tasks will be completed during the Q1 of 2021.

The delay in instrumentation of the RSS at the sites has resulted in a delay in preparing the installation reports and draft final report. We will be requesting a 6 month no-cost extension on the contract to complete the work as a result of the permitting delays and COVID-19.